McNAUGHT BEAM ENGINE

1854

HISTORIC ENGINEERING MARKER

SUBMISSION

and

CEREMONY REPORT

T0109

1997

CONTENTS

Commemorative Plaque Nomination Form

Date..Sept. 1996

To:
Commemorative Plaque Sub-Committee
The Institution of Engineers, Australia
Engineering House
11 National Circuit
BARTON ACT 2600

From..Chairman

Engineering Heritage Committee

Tasmania Division

Nominating Body

The following work is nominated for a:-

* ~~National Engineering Landmark~~
* Historic Engineering Marker

*(delete as appropriate)

Name of work. BEAM ENGINE (A W SMITH & Co, PAISLEY 1854)

Location, including address and map grid reference if a fixed work.....

HOBART INSTITUTE OF TAFE

CNR. CAMPBELL & ARGYLE STREETS, HOBART

Owner..HOBART INSTITUTE OF TAFE/TASMANIAN MUSEUM & ART GALLERY

The owner has been advised of the nomination of the work and has indictated (attach a copy of letter if available)...COPY OF LETTER FROM DIRECTOR OF TAFE (PAGE 5)

Access to site.....OPEN TO THE GENERAL PUBLIC

Future care and maintenance of the work...WILL BE MAINTAINED AND SAFEGUARDED BY THE OWNERS

Name of sponsor.....F.N. LAKIN

For a NEL, is an information plaque required?.....

.....
Chairperson of Nominating Committee

R. L. Norris
.....
Chairperson of Division Heritage Committee/Panel

ADDITIONAL SUPPORTING INFORMATION

Name of work..... BEAM ENGINE .....

Year of construction or manufacture... 1854 .....

Period of operation..... UNTIL 1955 .....

Physical condition..... COMPLETE & SOUND .....

Engineering Heritage Significance:-

Technological/scientific value.....

Historical value..... WORLD'S OLDEST KNOWN McNAUGHT BEAM ENGINE .....

Social value.....

Landscape or townscape value.....

Rarity..... PROBABLY THE ONLY EXTANT EXAMPLE KNOWN OF THIS TYPE OF ENGINE

Representativeness.....

Contribution to the nation or region.....

Contribution ot engineering.....

Persons associated with the work..... W. McNAUGHT .....

Integrity.....

Authenticity.....

Comparable works(a) in Australia..... NONE KNOWN .....

(b) overseas..... A LATER EXAMPLE (1865) IN ENGLAND .....

Statement of significance, its location in the supporting documentation.....

REPORT BY P. MILNER (PAGE 10) .....

Citation (70 words is optimum)... SEE PAGE 9 .....

.....

.....

.....

.....

Attachments to submission (if any).....

Proposed location of plaque (if not at site).....

5

HOBART

institute of TAFE

All Correspondence to:
Director
GPO Box 2015
Hobart Tasmania 7001
Tel: (002) 33 7361
Fax: (002) 31 2899

Our Reference: KRJU/KA
Enquiries to: Mr John Upson

23rd July 1996

Mr Keith Drewitt MIE Aust CP Eng
Chairman Heritage Committee
Tasmania Division
Royal Engineers Building
2 Davey Street
HOBART Tas 7000

Dear Mr Drewitt

Subject: Beam Engine - Proposal for Placquing

I am pleased to receive advice from Mr Lakin that your Committee is in the process of submitting a proposal to your national Committee for the placquing of the Beam Engine.

As you are no doubt fully aware, this Institute has put considerable effort into the presentation of this historic engine on its present site and we are therefore most supportive of the proposal for this engine to be awarded National recognition by the Institution of Engineers Aust.

Please advise if you require any assistance from this Institute in regard to the furthering of this proposal.

Yours sincerely

KRJ UPSON
Director

K 6166

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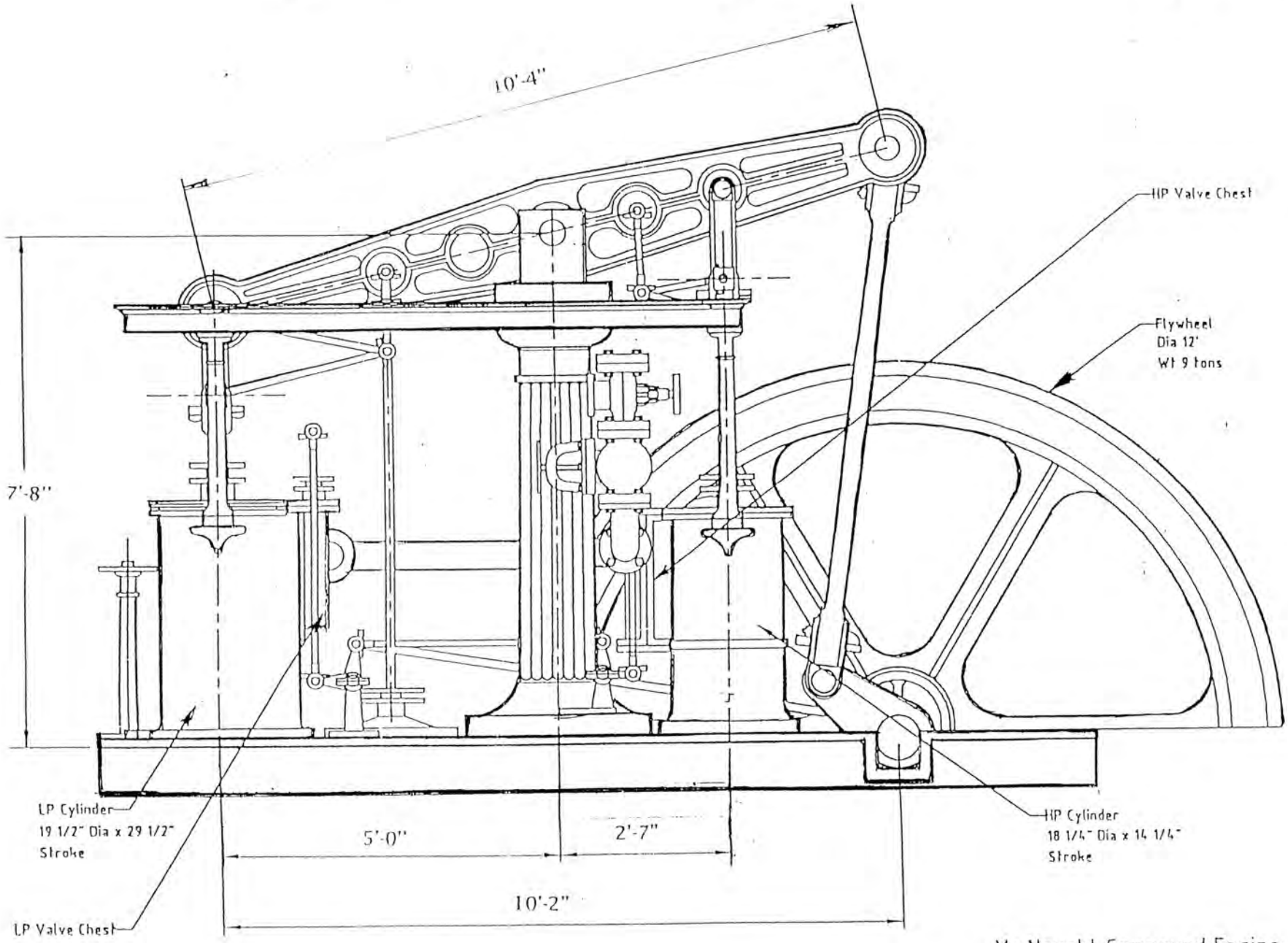

Drown P. Vincent
Sept 1996

Mc Naught Compound Engine
Built by A & W Smith & Co
Paisley in 1854

STATEMENT OF ENGINEERING SIGNIFICANCE

In September 1990, the engine which was built in 1854 by A & W Smith & Co, then of Paisley near Glasgow, was put on display at the Hobart Technical College (now the Hobart Institute of TAFE).

In 1955 after a century of working, the engine was removed from Risby's Mill and placed into storage for some 35 years in the Department of Main Roads Plant Depot at Moonah.

The engine is a McNaught Compound Engine weighing some 25 tonnes and the flywheel alone which is 3.7 metres in diameter weighs 9 tonnes. The placement of the two double acting cylinders, one on either side of the central column, was the subject of a 15 year patent taken out by McNaught in 1845.

Most early compound engines had the two cylinders positioned on the same side of the column, but the addition of the high pressure cylinder, to an engine designed only for low pressure use often resulted in overstressing of the beam. William McNaughts arrangement avoided this problem. In other respects, the engine is somewhat similar to other early engines and incorporates the parallel link motion which was patented by James Watt in 1784.

From the records of boiler inspections which commenced in 1885, it is known that at this time, the engine was operating in Henry Clark & Co's Sawmill in Collins Street, Hobart, this business was later bought out by Risby Bros in 1921. In July 1872 "The Engineer" (UK) reported on the manufacture by Mr. John Clark of Hobart Town of a boiler for a 20 hp McNaught engine used to drive a flour mill, however, details of ownership and location are uncertain. Henry & John Clark were the sons of Alexander Clark, a prominent engineer in the Colony.

Following upon the Institution of Engineers, Australia Engineering Heritage Conference held in Hobart in October 1992, further enquiries were made overseas by Prof. Angus Buchanan, Director of the Centre for History of Technology at the University of Bath, who was the keynote speaker at the Conference, and Dr. Peter Milner of the University of Melbourne.

As a result of these enquiries and based upon information contained in the publication "The Industrial Archaeology of the Steam Engine" of which Professor Buchanan was co-author, it appeared that the Hobart engine could be claimed as the World's Oldest Extant McNaughted engine. The oldest existing engine of this type in Britain was built in 1865. In May 1994, the Newcomen Society of London, the World's leading authority on such matters, confirmed this claim.

This engine is therefore of great historical interest, unfortunately little is known of the history of the engine prior to 1885; and its original use and date of arrival in Australia are a mystery. It is known, however, that Alexander Clark, arrived in Van Dieman's Land (Tasmania) in late 1832 and set up his own engineering business in 1838 which included both an iron foundry and workshops together with the importation of machinery. It is therefore considered most likely that he imported this engine.

F.N. LAKIN, MIEAust., CPEng.,
8/8/95

Additional Engineering Details

The engine although small by comparison to most Beam Engines made in Britain in the 19th century has many interesting features.

The most controversial feature is the placement of the high pressure cylinder which necessitated portion of the central column being cut away to make room for the steam line entering the valve chest. This arrangement results in the whole H.P. cylinder having to be removed in order to gain access to the steam chest and valve. Obviously this was the only possible solution for if the cylinder was turned through 180° the connecting rod would strike the valve chest. In outward appearance the two cylinders are similar in size, however, the lower one third of the HP cylinder is in effect a pedestal, whilst only the upper two thirds is the cylinder proper. The lower pedestal section has a cut away portion to provide clearance for the crank shaft and connecting rod. The cylinder dimensions re as follows:-

HP cylinder 18" diameter bore x 14.5 stroke

LP cylinder 19.5 diameter bore x 29.5 stroke

resulting in a capacity ratio of 2.36:1

Whilst initially the foregoing led to the conclusion that the engine had been McNaughted, i.e. the H.P. cylinder had been added at a later stage Dr. Milner in his report considered that the engine was originally built as a compound engine, making use of existing patterns and components.

It should be noted that the article appearing in The Engineer of July 1872 which confirmed Dr. Milner's findings was discovered by Dr. Milner well after he published his paper in November 1992. Further examination of the engine confirmed this opinion.

Another notable feature is the way in which the bedplate and valve control linkages and shafts have been built so as to enable the flywheel and drive to be mounted on either side of the engine.

Other features of interest are the use of artistically tapered columns, both for the central beam supporting column and the minor columns supporting the entablature. Most moving parts are assembled and held together by the use of tapered keys.

The flywheel is cast in two halves and balanced by some 16 balance weights bolted into recesses in the rim. As is common practice with engines of this type the hub of the flywheel is bored out considerably larger than the diameter of the crankshaft and secured to the shaft by four flat wedges.

Although the engine was initially operating under a pressure of 40lbs per square inch in later years it was operating under a pressure of up to 100lbs per square inch.

The operating pressure of the engine prior to removal in 1955 was 80lbs per square inch at 80/90 rpm and it was providing power for a large sawmill and joinery complex.
The only other land based beam engine listed in the boiler inspection records of 1885 was a 15h.p. unit of unknown make operating with a pressure of 35lbs per inch at D. Ritchie & Sons flour mill in Launceston.

SUGGESTED WORDING ON PLAQUE:

WORLDS OLDEST EXISTING McNAUGHT BEAM ENGINE

This Compound Engine which was built in 1854 by A & W Smith & Co., then of Paisley near Glasgow was removed from Risby's Sawmill in Collins Street, Hobart in 1955 and placed in its present position in 1990.

The placement of the two double acting cylinders, one on either side of the central column was the subject of a patent taken out by William McNaught in 1845.

The exact date of its arrival in Tasmania is uncertain, but it is thought to have been imported by Henry Clark, a prominent engineer who arrived in the Colony in 1838.

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A MCNAUGHTED BEAM ENGINE IN HOBART

p milner

A report to Mr. F. R. Lakin,
The Institution of Engineers, Australia,
Tasmania Division.

Technology Note
No. TN-92/35

November 1992

According to the brass plate on the valve (which is adjacent to the low pressure cylinder) the McNaughted rotative beam engine, which is displayed in front of the Hobart Technical College in Bathurst Street, was built in 1854. If this is taken at face value, then the engine was built just nine years after William McNaught had taken out a patent for this arrangement. It has been suggested, however, that as the high pressure cylinder, which is attached to the outer end of the beam, is positioned so awkwardly, it must have been added later. That is, the fluted cast iron pedestal, which supports the centre bearings of the beam, has been recessed in order to make room for the pipe supplying steam to the valve chest. There is also very little clearance between the valve cover and the column, so that the maintenance of the valve surfaces could only have been properly carried out with the cylinder removed from the engine. This cramped location for the valve chest, though, appears to have been necessary; for if it had been on the opposite side it would almost certainly have interfered with the motion of the connecting rod. All this suggests that the high pressure cylinder was added some time after the engine had come into service. This accords with the way in which this arrangement was introduced initially; where an engine owner wanted to increase the available power without installing a completely new engine.

Although the awkward arrangement of the high pressure cylinder does suggest a later modification, it is unlikely in this case as the cylinder is located against the base of the central cast iron pedestal by means of a lug which is cast integrally with the bedplate. Furthermore, the arrangement of the valve chest on the opposite side to the crank appears to have been the normal arrangement, according to Figure 1 - the smallness of the beam producing the cramped arrangement below; and finally, the base of the high pressure cylinder is recessed to provide clearance for the gudgeon pin. That is, whether the high pressure cylinder was actually installed when the engine was built, or at some later date, it is evident that whoever designed the engine intended it to be arranged as it now is. In the absence of any evidence to the contrary it can only be concluded that the engine was McNaughted as built. For the period in question this appears to be unusual.

It is quite likely that the design, rather than the actual arrangement, is a modification of an earlier, single cylinder engine design; and this goes some way to explaining why the arrangement is so awkward. That is, the designer appears to have been overly constrained by the need to make as much use of existing components as possible: low pressure cylinder, beam, bedplate, connecting rod and crank. The arrangement might have worked if the high pressure cylinder had been smaller. In this case, however, the diameter of the high pressure cylinder appears to be marginally larger than that of the low pressure cylinder. This is quite the opposite of what one might have expected (e.g. the Bracewell engine of 1865 in List 1), but it is possible that the designer was also attempting to achieve a driving moment about the centre of the beam which was exactly double that which would have been supplied by the low pressure cylinder alone. For the same speed this would have doubled the power of the engine. Satisfying both of these sets of requirements simultaneously, if that is in fact what happened, has resulted in a compromise which is not particularly elegant.

It might appear that the makers have simply used two standard cylinders. As beam engine cylinder diameters of 12, 13, 14, 15, 16, 17 and 18 inches were common, this could have been achieved quite easily. But a more detailed study of the high pressure cylinder indicates that the bottom one third of the cylinder is hollow and merely provides a pedestal for the cylinder proper, that there is no external steam channel from the valve chest to the base of the cylinder (as in the case of the low pressure cylinder), and that the crank side of the cylinder has been specially recessed, as already noted. This suggests that even if the diameter of the high pressure cylinder was standard, many of the other details are not. The only other modifications needed were to the bedplate (to provide positive location for the additional cylinder), and possibly to the beam and connecting rod (to increase their strength, although increases in working stress may have been acceptable, given the factors of safety built into the early designs).

Whilst this arrangement is by no means the most elegant, the obviously contrived arrangement on an engine built that way initially is interesting, and the early date does suggest that this engine has a rather special significance as a transitional design between the time when simple engines were McNaughted as an afterthought, and when the McNaughted arrangement was properly worked out. It also illustrates some of the difficulties in McNaughting a small beam engine.

The best available source of information on extant steam engines in Britain, where comparable examples may be found, is still that provided in Part Three of "The Industrial Archaeology of the Stationary Steam Engine" by Angus Buchanan and George Watkins, which was published in 1976. From this source List 1 has been constructed for all compound steam engines made prior to 1866 and extant in Britain at the beginning of 1974. There are at least six steam engines of this type. From this it may be observed that:

1. only two engines are earlier than the Hobart engine, although neither of these appear to have been scheduled for preservation at the time the book went to press,
2. the earliest preserved compound engine was made about two years after the Hobart engine,
3. the only McNaughted engine preserved in Britain was made in 1865, or some 11 years after the Hobart engine,
4. no engine from the works of A. and W. Smith appears to have been preserved in Britain, and
5. the Hobart engine is a rare example of an engine of Scottish manufacture.

In addition, as already noted, the Hobart engine is a rare (if not unique) example of an engine of transitional design.

All these conclusions are subject to revision for two reasons. Firstly, there is not enough information about the Bracewell engine of 1865 to determine where it fits in the pattern of evolution for engines of this type; and secondly, because of the reference in Buchanan and Watkins to two other McNaughted engines for which no details are supplied; one of these is held by the Kelvingrove Museum at Glasgow and the other by the Northern Mill Engine Preservation Society. In addition, of course, there may be other McNaughted

engines not referred to in the book (which makes no claims to completeness), and other early compound engines preserved in other countries.

List 1 is an abbreviated version of a much larger list which can be constructed from the information supplied by Buchanan and Watkins. Of the 132 engines in that larger list which were extant in 1974, only 50 were preserved at the time. The remainder were either derelict (1), disused (21), on stand-by (7), or still working (46). Given the changes which have taken place in British industry since that time, it is quite likely that some of the engines in the latter categories would have been scrapped. This suggests that engines which are now extant have an even greater rarity value than the list would indicate. In particular, there is an outside possibility that the Hobart engine is the oldest extant compound engine in the world. This needs to be examined in further detail by reference to both European (particularly British and French) and American sources.

There may come a time when it would be desirable to put the engine under some sort of cover, both for security and to prevent corrosion.

References:

A. Rigg, "A practical treatise on the steam engine." London, 1878.

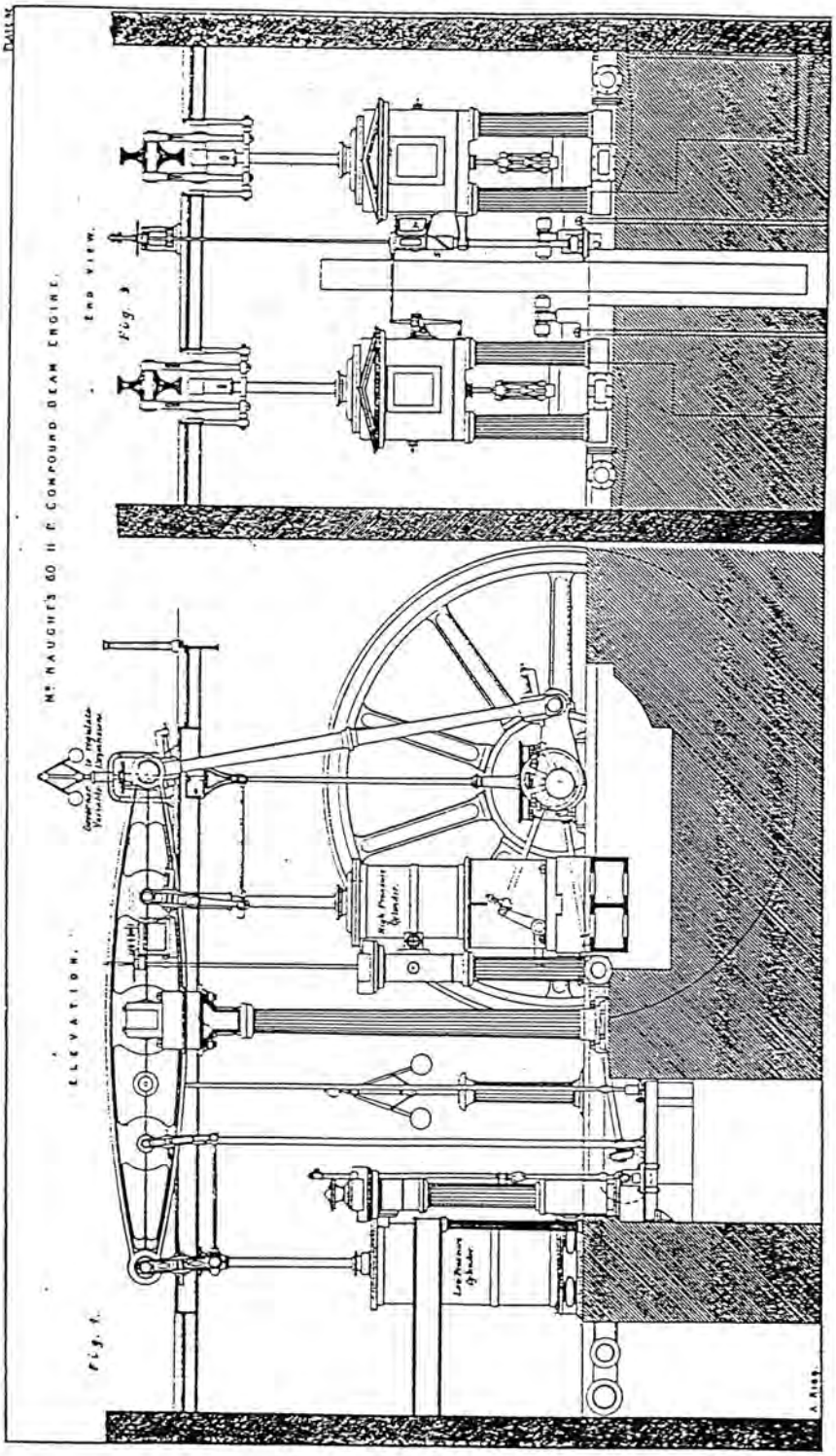


Figure 1: Side and end elevations of a 60 horsepower McNaught compound beam engine.
Source: Rigg, 1878, Plate 92.

LIST 1

COMPOUND STEAM ENGINES MADE IN BRITAIN
BEFORE 1866 AND EXTANT IN JANUARY 1974.

Note 1: The format of each entry is <maker's name> <principal dimensions> <engine type> <modifications>; <location> <status as at January 1974> <reference>

Note 2: The numbers in square brackets at the end of each entry are the page numbers in R. A. Buchanan and G. Watkins, "The industrial archaeology of the stationary steam engine." London, Lane, 1976.

Date	Number	Engine/location
1835	1	Wentworth and Sons 9 inch x 30 inch and 15 inch x 42 inch 16 horsepower Woolf compound rotative beam, engine; Ram Brewery, Young and Company, Wandsworth (working) [151]
1845	1	Wentworth 12 inch x 30 inch and 15 inch x 40 inch 40 horsepower Woolf compound beam engine; Green Brothers, Beeleigh Mill, Maldon (?) [143]
c1856	1	Easton and Amos (?) ?50 horsepower Woolf compound beam engine; Somerset County Museum, Taunton Castle, Taunton (ex Pearsall's Silk Mill) (preserved) [158]
1858	1	Hawthorn Woolf compound rotative beam engine; Industrial Museum, Courtyard Buildings, Wollaton Park, Nottingham (preserved) [156]
1863	1	Easton and Amos 15 inch x 45 inch and 30 inch x 60 inch compound rotative beam pumping engine; Cliftonville Waterworks, Mid Northamptonshire Water Board, Northampton (preserved) [155]
1865	1	Bracewell 18 inch x 24 inch and 24 inch x 48 inch 160 horsepower McNaughted beam engine; Bradford Industrial Museum, Moorside Mills, Eccleshill, Bradford (preserved) [164]
ud	1	Kelvingrove Museum, Glasgow [72]
ud	1	Northern Mill Engines Preservation Society [73]

8 Braidburn Crescent
Edinburgh
EH10 6EN

19/12/92

Dr R A Buchanan
Centre for the History of Technology
Science and Society
University of Bath
Claverton Down
Bath
BA2 7AY

Dear Angus,

Many thanks for your letter of 15 December about the engine in Hobart and other matters. I hope you had a good trip 'down under'.

This a quick answer based on the information I have to hand at home but I will try to provide additional information shortly.

Am I correct in thinking that the reference to A & W Smith, on page 4, indicates that this is believed to be one of theirs? This firm were chiefly makers of sugar machinery and therefore a high proportion of their production would have been exported. There can never have been many of their engines working in Britain and I do not know of any survivors. The one in Hobart is therefore of interest simply as one of their products, quite apart from the interest it has as a McNaught compound. It is of course more than likely that some more modern Smith engines are in derelict sugar mills in various parts of the world, and indeed there may well be some still working. They were building steam engines for sugar mill drives into the 1950s. Some early Smith records still exist in Glasgow, and if you can get some details of the working location of the engine I will see if I can find any information.

Turning to the design of the Hobart engine, two things strike me. First of all I think it is the smallest McNaught compound I have heard of. In addition, it is the only one with the beam supported by a central column although this was quite a common arrangement for small single cylinder beam engines. From Peter Milner's description it certainly has a number of odd features, but it seems to me that these are largely a consequence of trying to McNaught a small single column engine. Every other McNaught engine for which I have seen a drawing or photograph has either been house-built or of the six column type. Both of these arrangements would leave plenty room for access to the high pressure valve chest. My guess is that the Hobart engine was built as a McNaught. The amount of work needed on the bedplate and column seems more than would be justified for a conversion but it is quite likely, as he suggests, that the design was based on that of an existing single cylinder engine, using the old foundry patterns suitably modified.

I am sure that the small size of the engine is more significant than

any question of a transitional design. Single cylinder engines were being built quite late on and subsequently McNaughted. Conversely, some earlier engines were built as McNaught compounds.

I can add some information to that in List 1.

a. The Wentworth engine of 1835 is, I believe still in situ at the Ram Brewery, but I do not know if it is in use. There was also a similar engine of 1867 but I have no recent information on this one. The Beeleigh Mill engine was still in existence around 1980 and viewable by appointment (see G Hayes, A Guide to Stationary Steam Engines, Moorland Publishing, Ashbourne, 1981), but I do not know its present state.

b. The 1863 Easton & Amos engine from Clftonville waterworks has now been moved to the Kew Bridge Engines Trust, Green Dragon Lane, Brentford, where it is steamed regularly.

c. The McNaught engine at Bradford Industrial Museum, 1865 (or 1867, as given by G Hayes), by Bracewell & Co has a Corliss valve high pressure cylinder. This is almost certainly a later addition although I do not know whether it was a replacement for an original slide valve cylinder, ie the engine was built as a McNaught, or if it was put in in the course of a conversion. The low pressure cylinder has a slide valve. It is a house-built engine. Peter Milner asked if this was a transitional design. I think not; it was fully developed but as I mentioned earlier, but I don't see the Hobart engine as transitional either. Its odd features are the consequence of its small size and the single column construction.

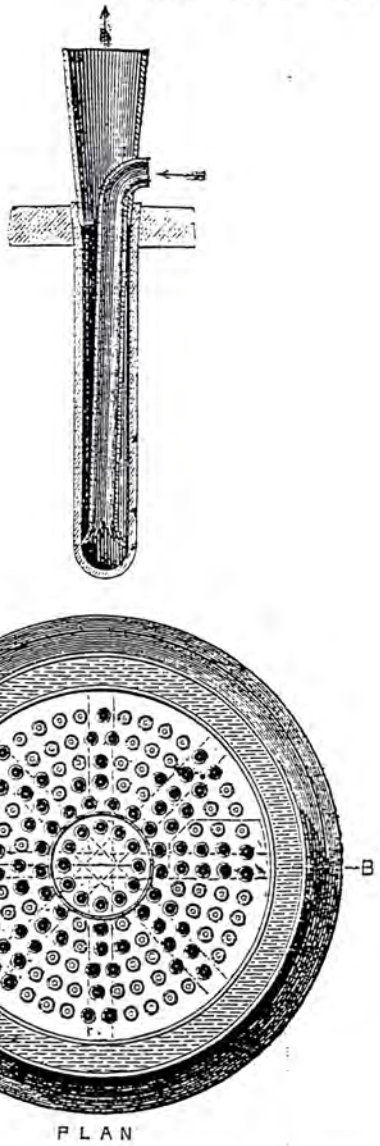
d. The engine held by the Northern Mill Engine Society came from Fisher Firth Ltd, Cellarsclough Mills, Marsden, nr Huddersfield. It is said to have been built in 1884 and modified by Woodhouse & Mitchell between 1907 and 1914. It is not clear if W & M were the orginal builders, nor exactly what modifications they carried out, but I will try to obtain more information. The cylinders are 20" x 36" and 36" x 72", and it therefore appears to be the largest McNaught compound surviving in the UK. This, like the Bradford one, is a house-built engine. As far as I know it is still dismantled.

e. Glasgow Museums' engine is now on loan to the Summerlee Heritage Trust, Coatbridge. It was stored in appalling conditions and is in a sad state. Storage at Coatbridge is better but I do not know of any plans to rebuild it. This was two six column engines with a common crankshaft. The engines were of different dates, I think 1860s and 1880s. As far as I know they were built as McNaught compounds. The builder was Turnbull, Grant & Jack, Canal Basin Foundry, Port Dundas, Glasgow. I have come across some evidence which suggests the Canal Basin Foundry (but possibly under different ownership) may have built the very first McNaught compound, and that this was a new build rather than a conversion.

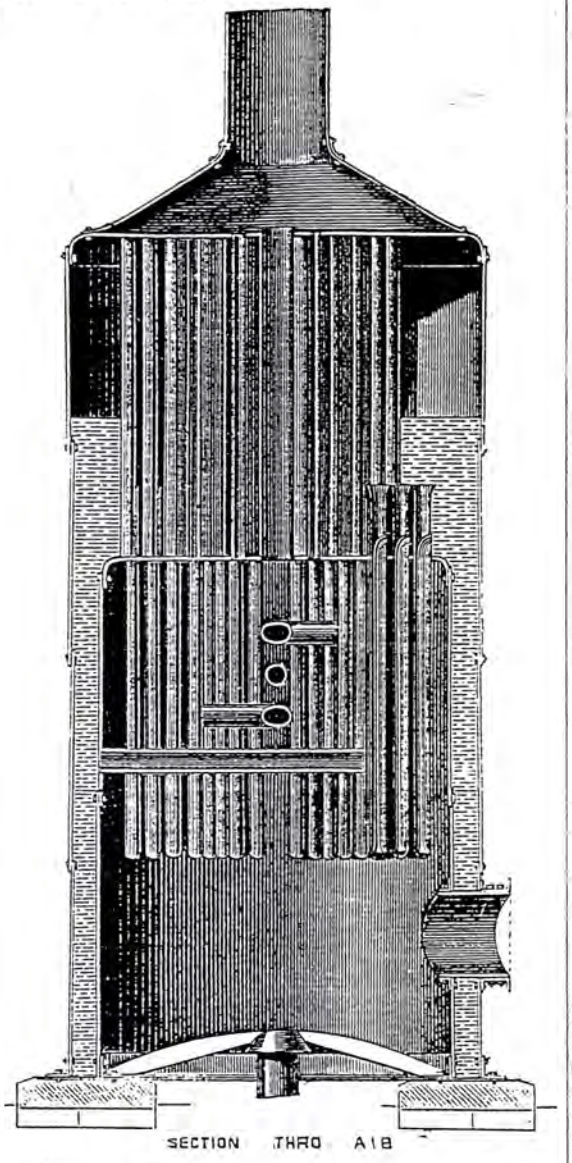
f. There are of course the two separate McNaught compounds, both by Turnbull Grant & Jack, at the former distillery in Dublin (Powers, I think), now the National College of Art & Design. Were you on the never-to-be-forgotten Newcomen Society Summer Meeting which visited them? At that time they were complete but a bit neglected and beginning to rust. I subsequently wrote to the College and suggested

CLARK AND MACKAY'S BOILER.

MR. J. CLARK, NEW WHARF, HOBART TOWN, ENGINEER.



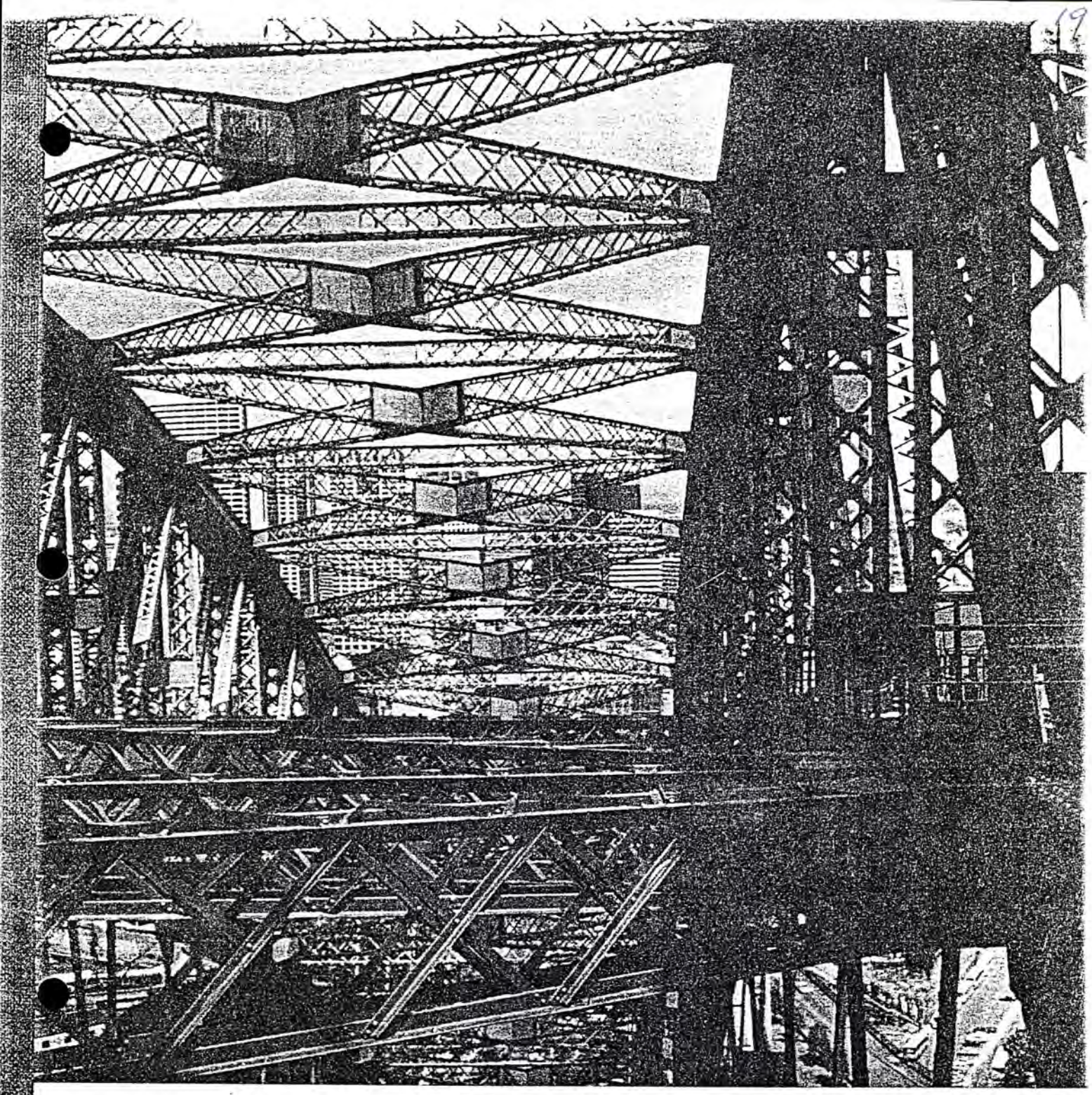
PLAN



SECTION THRO A1B

In the accompanying engraving we illustrate a boiler that has been constructed by Mr. John Clark, of Hobart Town, from the designs of Messrs. Clark and Mackay. The boiler is vertical, and is in height upwards of 12ft., with a diameter of 6ft. It has a fire-box 5ft. in diameter, with 98 water tubes, each of 3in. in diameter and 4ft. in length. In the midst of the Field tubes are placed four longitudinal water tubes, 5ft. long and 4in. in diameter. From the crown of the fire-box there are leading 100 fire tubes, 2½in. in diameter and 4ft. long; and also a smoke tube 4ft. long, with a diameter of 8in. The interior of the furnace itself presents an area of 20 square feet grate surface, and the total heating surface of the boiler is computed to be 1500 square feet. The form of the fire-grate is convex to a centre of 8in. The engine, previous to its leaving the manufactory, was proved by Mr. Clark up to 100 lb. steam pressure to the square inch, the working pressure at the mills where it is in use being 40 lb. to the square inch. The boiler in question works a 20-horse power M'Naught beam engine, driving seven pairs of 4ft. millstones, two silk dressers, and all the requisite cleaning, conveying, and elevating machinery for the seven pairs of stones. Several smaller boilers have been fitted in steam launches and worked with sea water; and, we understand, one has been constructed which works four 5½in. cylinders, 6in. stoke, at 300 revolutions a minute, and which steams upon green wood fuel. This boiler is 3ft. 6in. in diameter by 6ft. 6in. high.

DEAR FRED,
I CAME ACROSS THIS ARTICLE IN THE ENGINEER, 34 26 JULY 1872 WHICH I THINK MIGHT BE OF SOME INTEREST.
I SUSPECT THAT IF YOU FIND THE FLOUR MILL YOU MAY WELL ESTABLISH THE PROVENANCE OF YOUR ENGINE
WITH BEST WISHES,
PETER MILNER

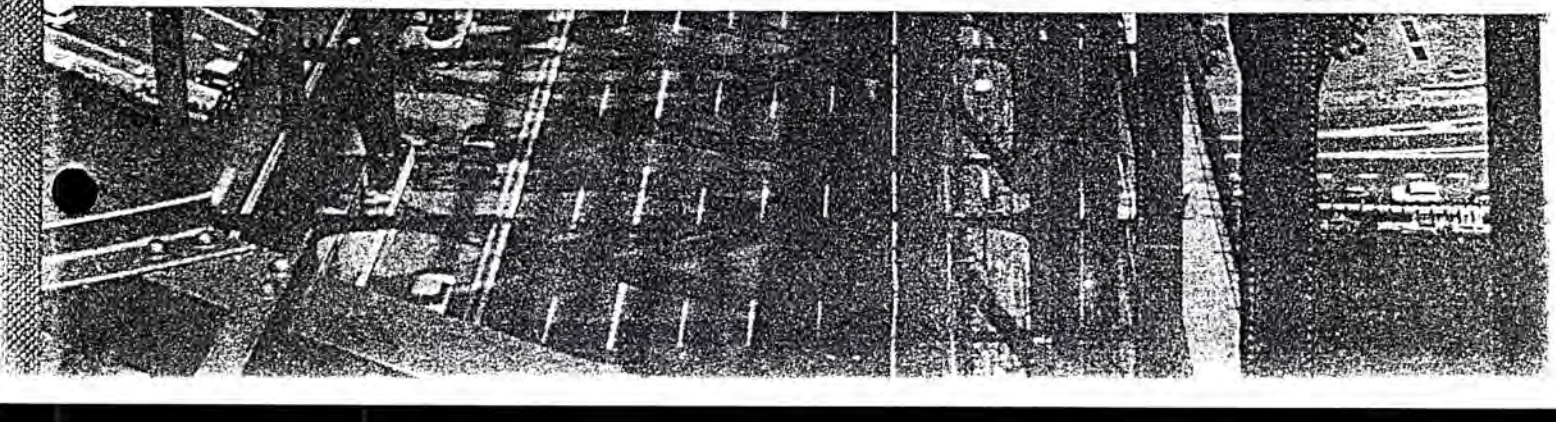


OZ 92

Reflections on the Australian Engineering Heritage in 1992

Centre for the History of Technology

Director:
Professor R. Angus Buchanan



HOBART Apart from the proceedings of the Conference, we were able to look at several industrial monuments in Hobart. There are many fine heritage structures in the old part of the city, around the dock basin with its well preserved mobile crane. There seemed little hope of doing anything about the gasworks, isolated in a traffic circulation systyem, but the "Engineers' House", once part of the railway terminus, has been appropriately restored to provide offices for the Institution of Engineers, Australia. The Powder Magazine preserved in the "Domain" seemed rather neglected, but it is an impressive structure and deserves to be well displayed. Outside the entrance foyer to the Technical College there stands a mid-nineteenth beam engine, for which it is likely that a claim could be made that it is the oldest surviving MacNaught-compound steam engine: investigations into its provenance are still in progress. but whatever the outcome it deserves to be moved into a better protected environment.

THE NEWCOMEN SOCIETY

FOR THE STUDY OF THE HISTORY OF ENGINEERING AND TECHNOLOGY

A company limited by guarantee registered in England No. 691545

Registered in the United Kingdom as a Charity, No. 215410

M. T. WRIGHT, M.A. (Oxon)
Hon. Secretary
CLIVE ELLAM M.Sc. M.I.Mech.E. M.R.Ae.S.
Executive Secretary
Telephone and FAX: 071 589 1793

Registered Office
THE SCIENCE MUSEUM,
LONDON, SW7 2DD

26 May, 1994

Mr Fred Lakin
President
Hobart Technical College Council
75 Campbell Street
HOBART
Tasmania 7002
AUSTRALIA

Dear Mr Lakin,

A W SMITH & CO McNAUGHTED BEAM ENGINE

Thank you for your interesting letter of 6 August 1993 about your 1854 McNaughted beam engine. I apologize for the long delay in replying to you but we felt we had to spend a little time looking into the matter and our response was then further delayed when I became ill and was away from the office for two months, during which time affairs were run by volunteers, who were able to attend only to the most urgent matters.

So far as we can see from the material available to us, you do indeed appear to have the world's oldest surviving McNaughted beam engine, although there is always the possibility that continuing research elsewhere may upset that judgement. however, I suggest that you cross that bridge when you come to it. Interestingly enough, next year will see the Centenary of McNaught's patent and we recently had some discussion here about how much notice should be taken of that event. One body of opinion held that, because the patent was not the first covering the compound working of engines, it was of no great account, while others argued that it was, nevertheless, significant because it enabled a great many existing beam engines to have their power output increased and their economy improved, so prolonging their lives in the face of rising demands for power. I think we shall probably take the latter view and include the patent in the list of significant anniversaries which will be published in our next *Newcomen Bulletin*.

Yours sincerely,

Clive Ellam

Clive Ellam
Executive Secretary

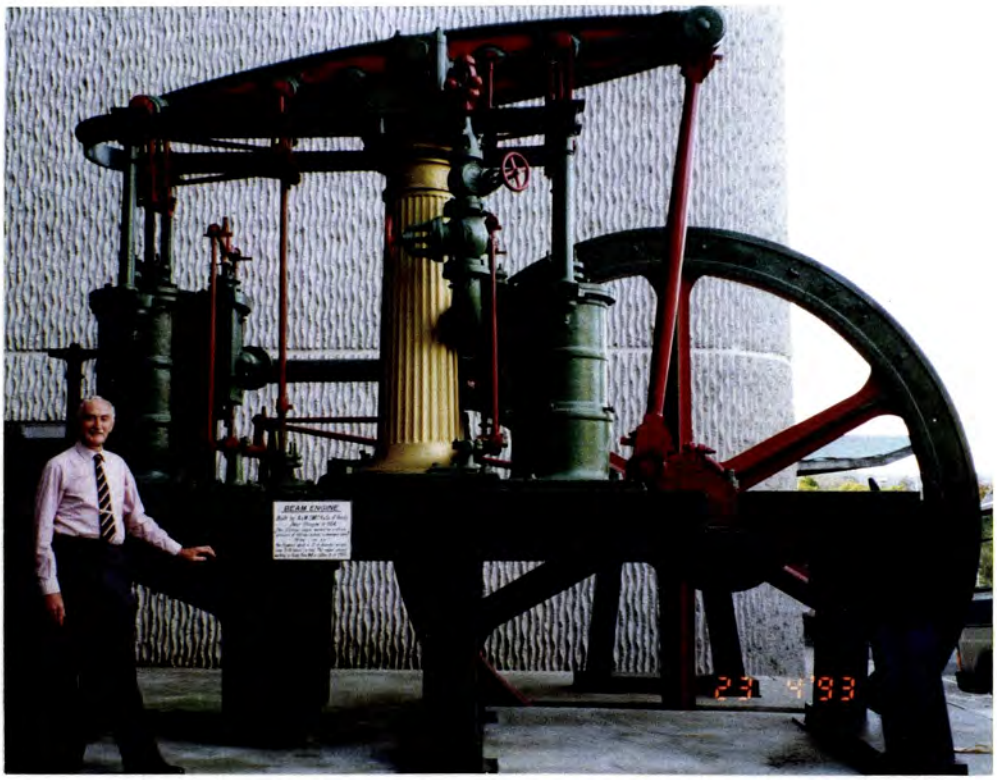


PLATE 1: **General View of A & W Smith & Co's McNaught Beam Engine Built in 1854.**

PLATE 2: **Brass Makers Plate dated 1854**

PLATE 3: View of Parallel Link Motion Patented by James Watt in 1784.

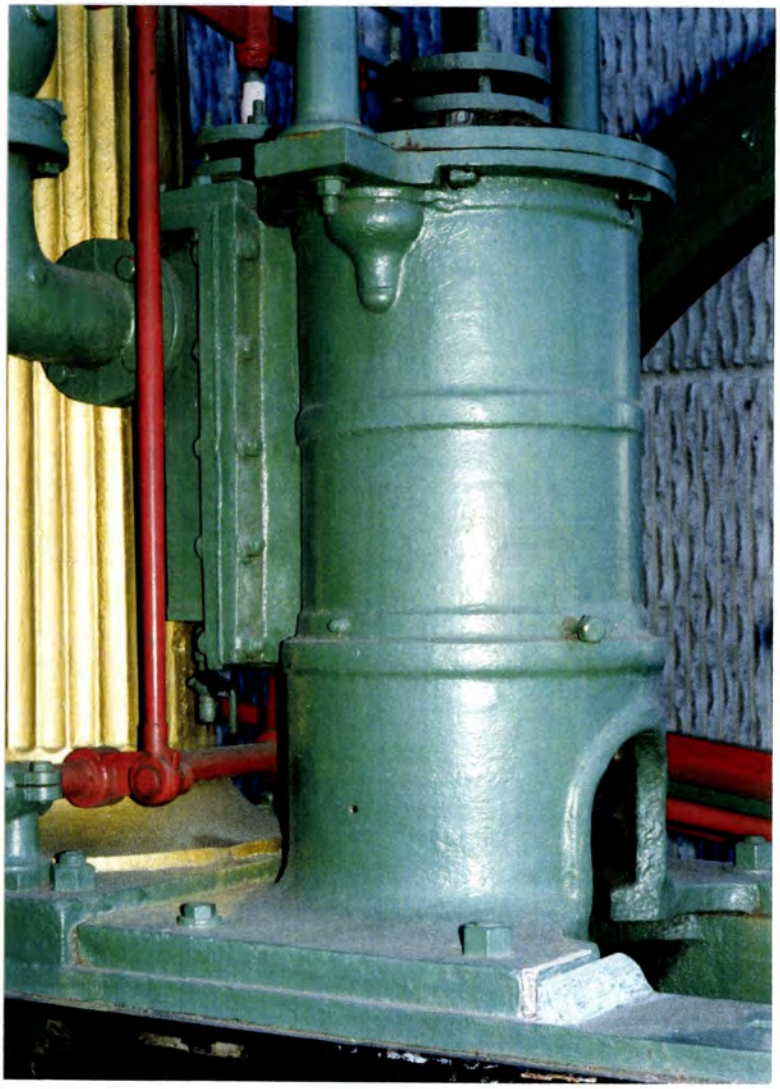


Plate 4: The Bottom one third of the surprisingly large H.P. cylinder is hollow & provides a Pedestal to support the cylinder proper.

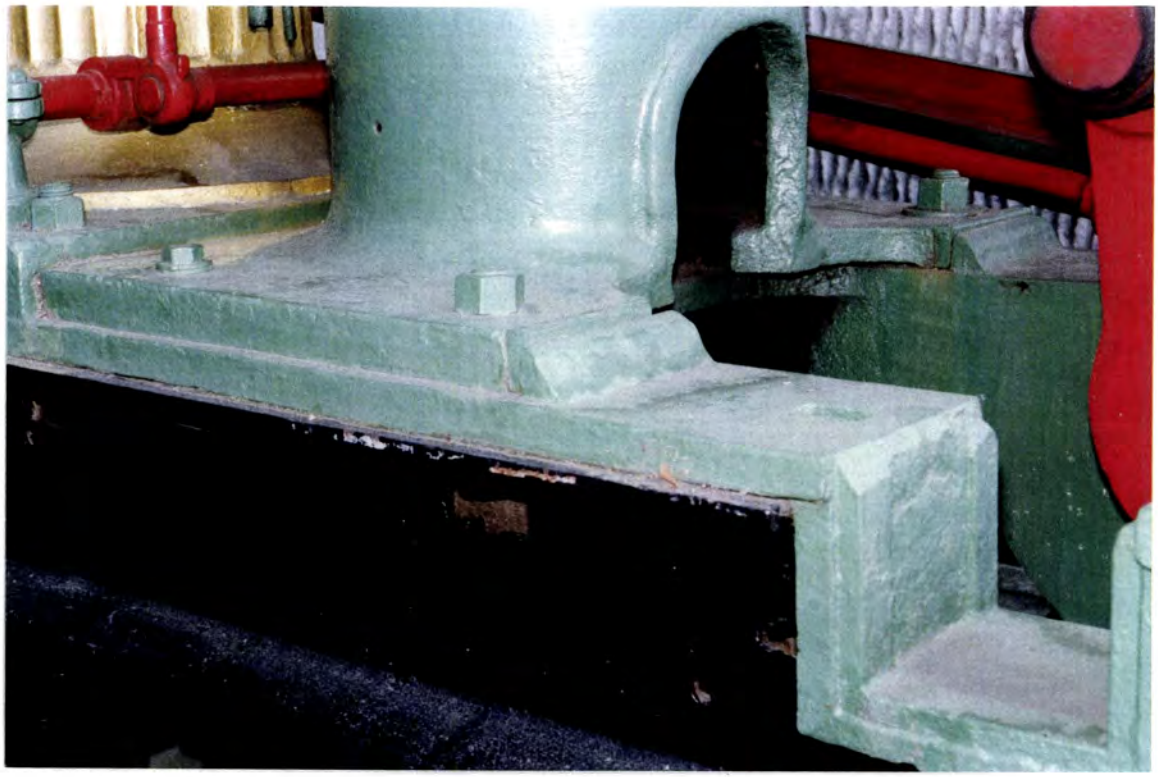


Plate 5: **Showing Integrally cast locating lugs in C.I. Base Plate for location of H.P. cylinder and cut away portion of the cylinder pedestal.**

Plate 6: **Showing recess cut into fluted central column to enable steam elbow to gain access to the H.P. valve chest, & the inaccessibility of the steam chest.**

Plate 7: **Showing the widespread use of keys in the Assembly of Engine components.**

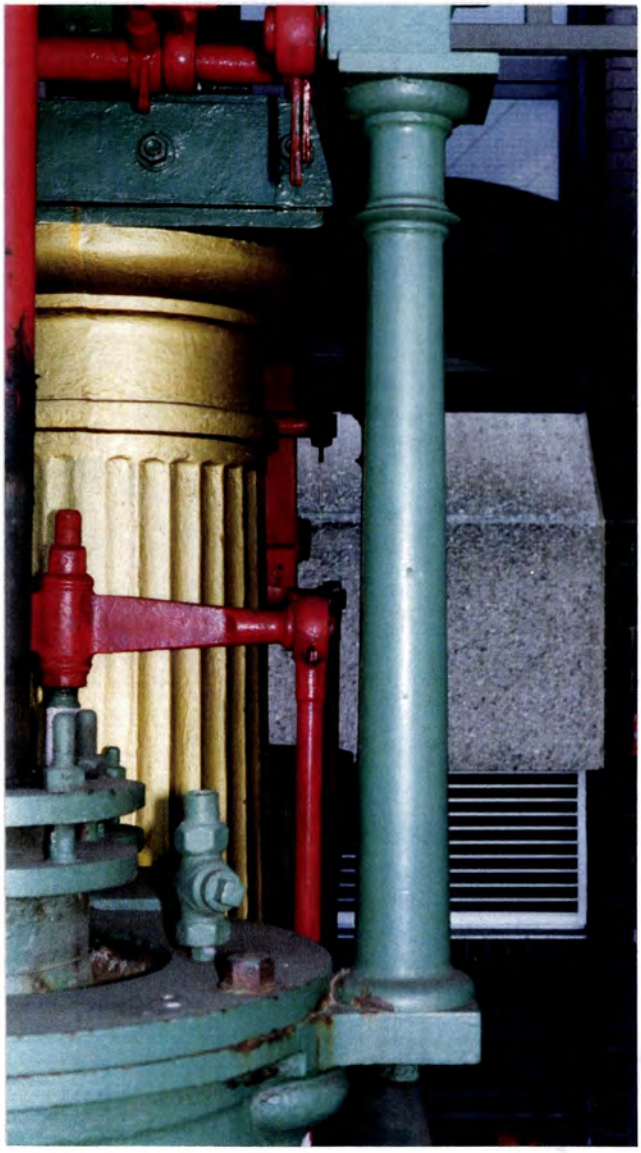


Plate 8: Tapered colums supporting the Entablature & fluted central column supporting the Beam.

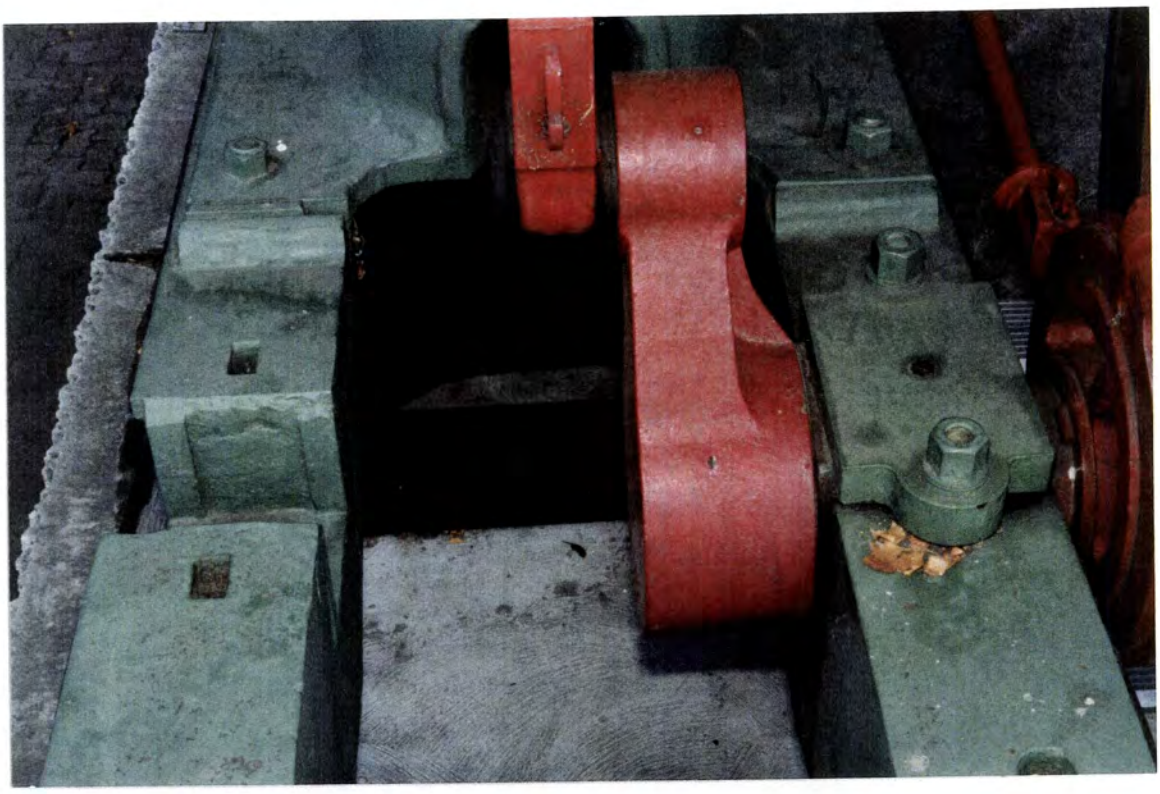


Plate 9: **Showing provision in the Bedplate casting for the drive to be taken out from either side of the Engine.**

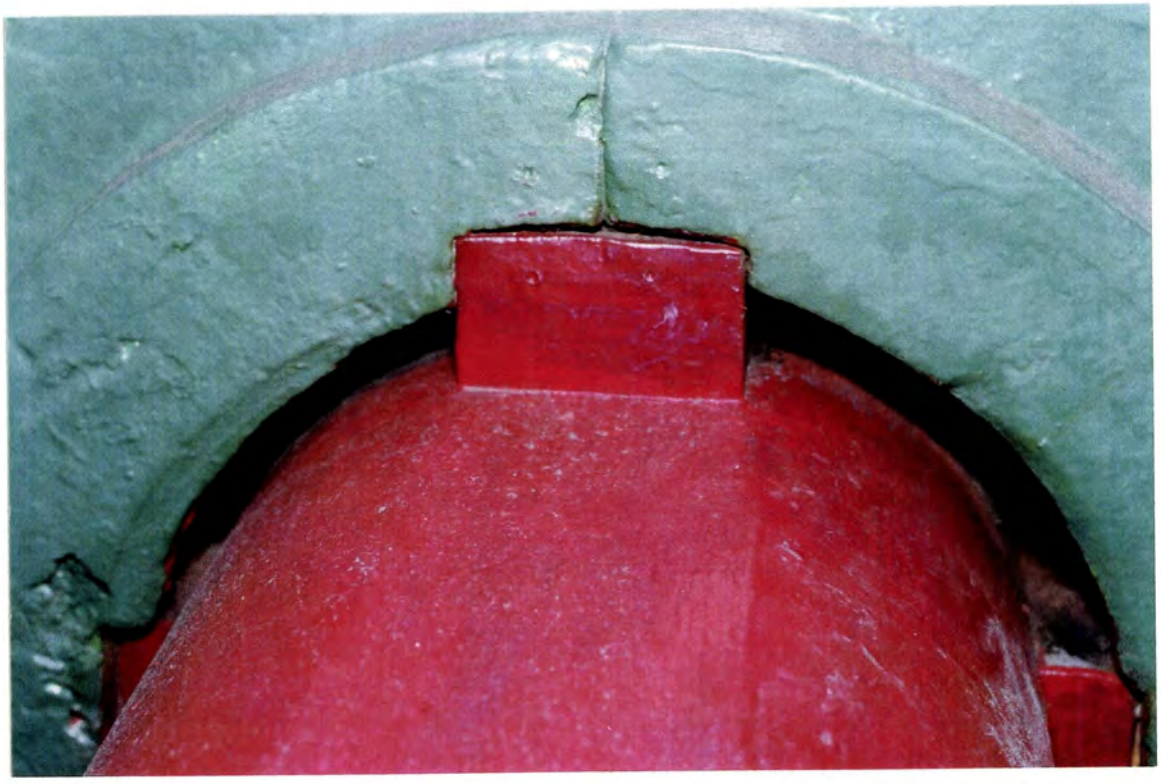
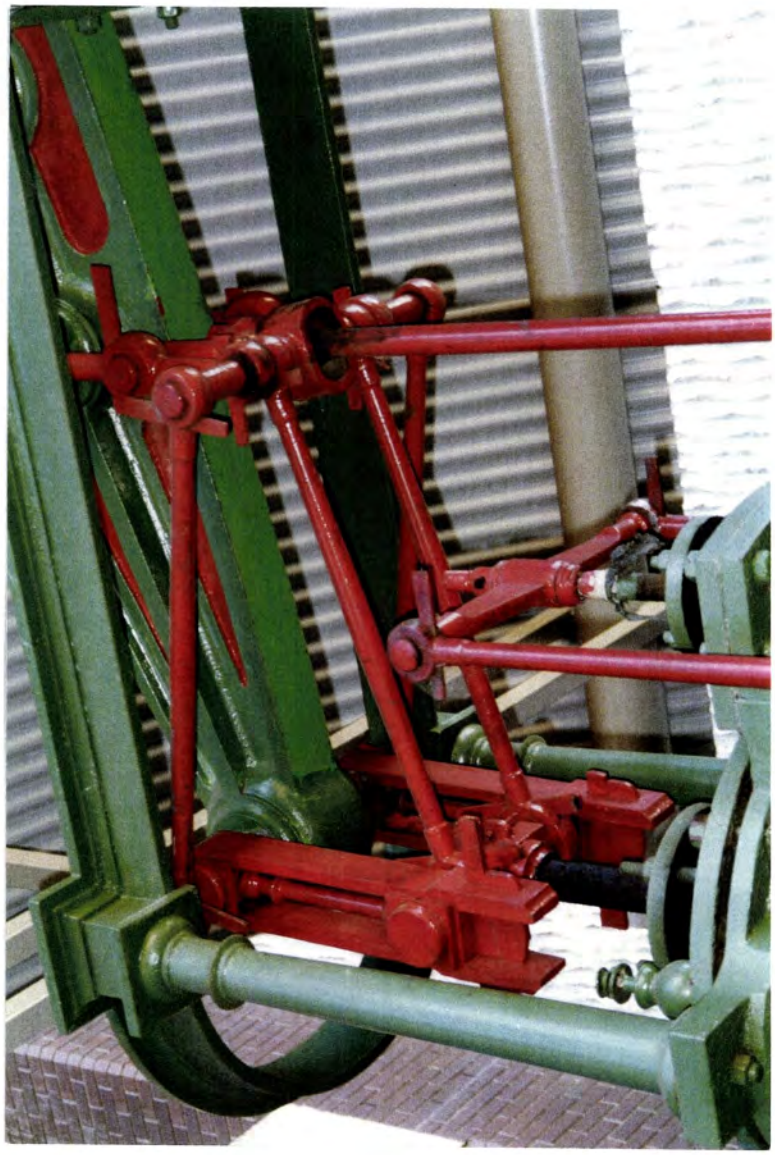
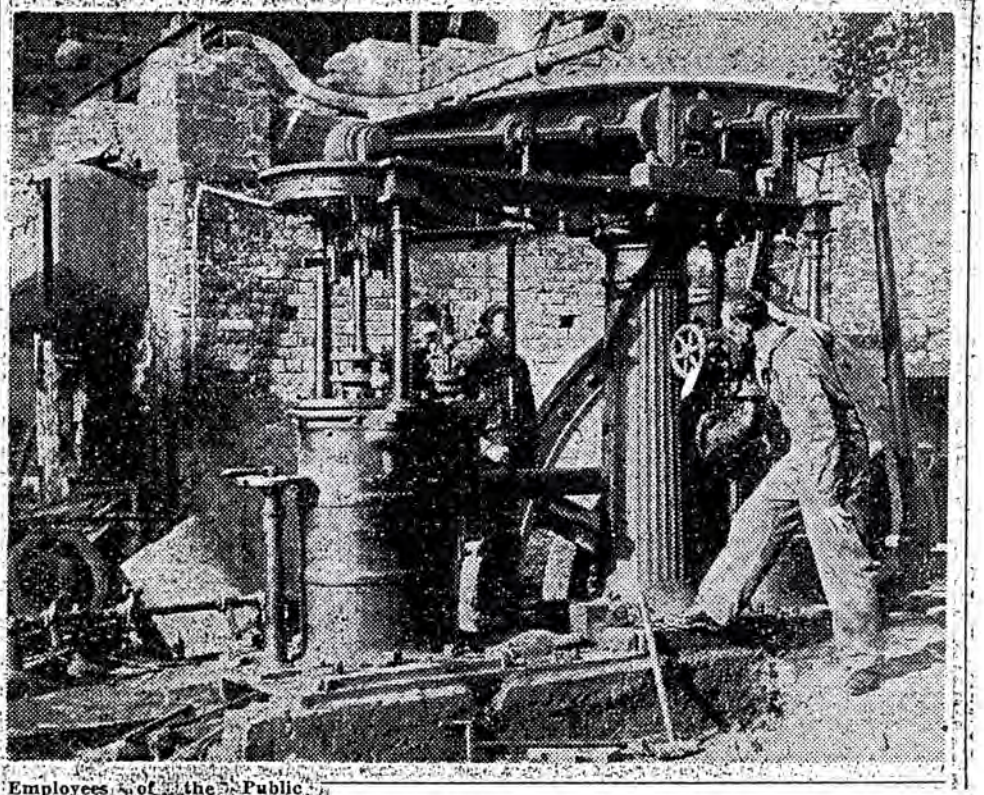


Plate 10: **Note excessive clearance between Flywheel & Crankshaft requiring the use of four large wedges.**



12 THE MERCURY, TUESDAY, SEPTEMBER 27, 1955

OLD ENGINE GOES TO REST



Employees of the Public Works Department yesterday dismantled a large and early type of beam engine in the timber yard of Risby Bros. Ltd., Collins St. The engine was built by A. and W. Smith and Co., of Glasgow, in 1854. Believed to be the only one of its type now in Tasmania, it has been accepted by the Scenery Preservation Board, which will store it until some place is available for its exhibition as an engineering relic. Picture shows (l. to r.) Messrs. H. C. Weeding, C. A. Stevens, and F. E. Laking (front) dismantling the engine.

Plate 11: Extract from the Hobart Mercury dated 27th September 1955 reporting removal of Engine from Risby Bros Mill in Collins Street, Hobart.

1854 McNaught Beam Engine

Historic Engineering Marker

Unveiling Ceremony

8 April 1997

Report

HISTORIC ENGINEERING MARKER

On the 8th April 1997 a H.E.M. to commemorate an 1854 McNaught Beam Engine was unveiled by the Deputy Premier of Tasmania, Mrs. Sue Napier at a Ceremony held at the Hobart Institute of TAFE where the engine is situated.

From research carried out it is confirmed by the Newcomen Society of London that this is the oldest know McNaught Beam Engine in the world and having been restored it is still in a workable condition. The restoration work was carried out under the supervision of Mr. Fred Lakin of the Tasmania Division Heritage Committee.

The plaque was presented by Mr. Tim Burbury FIEAust. the President of the Tasmania Division of the IEAust. Mr. Fred Lakin FIEAust of the Heritage Committee then outlined the history of the engine with slide illustrations and the plaque was unveiled by the Deputy Premier of Tasmania, Mrs. Sue Napier in front of 50 or so guests.

Mr. John Upson, Director of the TAFE Institute then responded on behalf of the Institute followed by Mr. Arthur Risby the former owner who donated the engine to the people of Tasmania.

Whilst the engine will remain at the TAFE Institute, the Tasmanian Museum & Art Gallery has accepted ownership of it for the people of Tasmania.

The several speakers were introduced by the Heritage Committee Chairman, Mr. Keith Drewitt MIEAust., who in closing the ceremony invited the guests to afternoon tea.

K.C. DREWITT, MIEAust., CPEng.,
Chairman,
Heritage Committee, Tasmania Division

I E Aust

The Institution of Engineers, Australia

The Hobart Institute of TAFE

HOBART

The President of the Tasmanian Division of
the Institution of Engineers Australia and
the Director of the Hobart Institute of TAFE
cordially invite

---

to attend the unveiling ceremony in
the Board Room of the Hobart Institute of TAFE

on Tuesday, 8th April 1997, at 3pm

of an
Historic Engineering Marker
awarded to a

1854 McNaught Beam Engine made by A & W Smith & Co.

by the Hon Sue Napier, MHA,
Deputy Premier and Minister for Education
and Vocational Training

Afternoon Tea will be served after the ceremony

RSVP by Tuesday, 1st April 1997
Tel: (03) 6233 7337

DVET

Minister's speech, Hobart TAFE, 8 April '97

WHAT: Minister's speech, unveiling of Historic Engineering Marker for noted beam engine and also announcing the handing of its ownership to the Tasmanian Museum & Art Gallery.
WHERE: Board Room, Hobart Institute of TAFE
WHEN: Tuesday, 8 April, 1997. Guests are invited for 3 pm. Director John Upson will meet the Minister at the Institute's Campbell St. entrance, 3 pm. Mr Upson will also introduce the Minister prior to her speech. Program attached.
NOTE: The event is jointly presented by the Institute and the Tasmanian Division of Institution of Engineers, Australia. About 100 guests of the Institute, the Institution. Principal organiser of the event is Mr Fred Lakin, Vice President of the TAFE Institute Council, who is largely responsible for the engine's maintenance and the locating of it at the Institute. The President of the Tas. Institution of Engineers is Mr Tim Burbury. *Representing the Museum will be its Trust Chairman ~~Mr Allan Blow~~ and Director* Ms Patricia Sabine
News release. Media invited. See attached brochure about the McNaught engine.

Ref Michael Tatlow 33 7314

- Thanks, John.
- Ladies and gentlemen.
- I thank the Tasmanian Division of the Institution of Engineers, Australia, and also the Hobart Institute of TAFE, for inviting me to join you today.
- And I take this opportunity to acknowledge Mr Tim Burbury, President of the Tasmanian Division of the Institution of Engineers, and also Mr Keith Drewitt, who is Chairman of the Institution's Engineering Heritage Committee.
- I also thank Mr Fred Lakin for his fascinating address about the 1854 McNaught Beam Engine, which has obviously been an important part of his life for more than 40 years.
- Fred continued looking after the engine in his retirement from Government service in 1982, and has been the machine's unofficial caretaker since it was installed outside this building seven years ago.
- This working model of the engine was made at the Moonah Workshop to mark Fred's retirement from there. The engine made by Mr Roger King, who is with us today.
- Fred, I'm sure, is well known to most of you, both as current Vice President and former President of the Council of the Hobart Institute of TAFE .... and also as a professional engineer and a member of the Institution of Engineers.
- I might add that Fred Lakin received his vocational training at the Hobart Technical College ... a long association indeed.
- Clearly, it is doubtful if we would still have ... and in pristine condition ... the oldest engine of its type in the world if it were not for Fred Lakin's tending of it at the

Moonah Workshops of the then Public Works Department and later at TAFE.

- We are very grateful, Fred.
- At this stage, I would like to note the presence with us of Mr Arthur Risby, former Managing Director of Risby Forest Industries.
- As you have heard, Mr Risby's company operated the McNaught engine for many years, and in 1955 donated it to the people of Tasmania as a significant part of the State's heritage.
- The Risby involvement continues through Arthur Risby's continuing interest in the machine's welfare.
- Last year Risby's paid substantially for the cost of providing a protective roof over the engine.
- And today I'm pleased to present Mr Risby with a framed photograph of himself, Fred Lakin and John Upson, with the machine, after the roof was completed.
- Mr Risby? ... Thank you.
- I'm especially pleased, on half of the Government, to be able to formalise this afternoon the recognition of, and help assure the preservation for future generations of, the McNaught Beam Engine an important part of Tasmania's heritage.
- First, I can announce that the Tasmanian Museum and Art Gallery has agreed to accept formal transfer of ownership of the engine from this Institute.
- I understand some details of the transfer are yet to be formalised, but arrangements are well progressed for the engine to become part of the Museum's Applied Science Collection.
- The engine will remain at its site by this Campus building's Bathurst Street entrance and the Institute will continue to care for and maintain it.
- But the transfer of formal ownership will ensure the engine's long-term safe keeping.
- I note the presence with us of ~~(Museum Director? Chairman Museum Management Trust?~~ and congratulate and thank TAFE and the Museum for this initiative.
- Recently I was able to intervene on behalf of the Government, as Minister for the Arts, in enabling the Queen Victoria Museum in Launceston to acquire an historic Burrell Traction Engine which had been on display at the Launceston offices of the former Department of Main Roads.
- The Burrell Traction Engine played an important role in the history of our State -- although it is only a 68-year-old youngster compared with our 143-year-old ~~McNaught.~~ engine.
- The McNaught engine's importance from an historical engineering point of view has been recognised by the Institution of Engineers, Australia, by its recognition as the world's oldest McNaught Beam Engine and the awarding to it of an Historic Engineering Marker.
- As we have heard, these Markers are quite rare, and are not presented lightly.
- I'd like to read to you the working on the marker, which will be affixed to the engine.
- It says: World's Oldest McNaught Beam Engine. ... This compound expansion steam engine incorporates

high and low pressure cylinders, one on either side of the central column, in accordance with the 1845 patent of William McNaught. Manufactured in 1854 by A.W. Smith of Paisley, near Glasgow in Scotland, it was probably imported by prominent local engineer, Henry Clark. In 1955, after 100 years of service, the engine was removed from Risby's Sawmill in Collins Street, Hobart, and placed here in 1990. Dedicated by The Institution of Engineers, Australia ... and the Hobart Institute of TAFE.

- I note in passing that the McNaught engine is 34 years older then even this historic Institute!
- I'm pleased now to unveil the Marker.
- Thank you.

701

Address by F. Lakin

McNAUGHT BEAM ENGINE

In 1955, over 100 years after its date of manufacture in 1854 by A & W Smith & Co of Paisley near Glasgow, this McNaught Compound Beam Engine was removed from Risby Bros Timber Mill in Hobart. It was placed on display at the Hobart Institute of TAFE in September 1990.

From the records of boiler inspections which commenced in 1885, it is known that at this time, the engine was operating in Henry Clark & Co.s Sawmill in Collins Street, Hobart, this business was later bought out by Risby Bros in 1921. In July 1872 "The Engineer" (a leading British Engineering Journal) reported on the manufacture by Mr John Clark of Hobart Town of a boiler for a 20 hp McNaught engine used to drive a flour mill, however, details of ownership and location are uncertain. Henry & John Clark were the sons of Alexander Clark, a prominent engineer in the Colony. (Another son Andrew, became Attorney-General and gave his name to the Hare Clark system of voting).

In October 1992 the Institution of Engineers Australia held the 6th National Engineering Heritage Conference in Hobart and it was most fortuitous that the Keynote Speaker at this Conference was Professor Angus Buchanan, Director of the Centre for the History of Technology at the University of Bath (UK). He is a recognised world authority on the history of early steam engines and a past president of the Newcomen Society.

Dr Peter Milner, Senior Lecturer in Mechanical Engineering at Melbourne University was also in attendance at the Conference. Both were impressed with the Historic Importance of the engine and Professor Buchanen later stated in his report on his Australian Tour that "... at the Technical College there stands a mid-nineteenth century beam engine for which it is likely that a claim could be made that it is the oldest surviving McNaught Compound Engine". He also went on to say that it should be better protected (35 years unprotected in the Moonah Plant Depot!).

Further enquiries were made overseas and in May 1994 the Newcomen Society of London confirmed that they were unable to find an older McNaught Beam Engine.

It is therefore fair to say that without the visit made and interest shown by both Professor Buchanen and Dr Milner, this engine would have remained just an interesting old engine and we would certainly not be assembled here today to witness the unveiling of an Historic Engineering Marker.

This engine is therefore of great historical interest, unfortunately little is known of the history of the engine prior to 1885; and its original use and date of arrival in Australia are a mystery. It is known, however, that Alexander Clark, arrived in Van Dieman's Land (Tasmania) in late 1832 and set up his own engineering business in 1838 which included both an iron foundry and workshops together with the importation of machinery. It is therefore considered most likely that he imported this engine.

SLIDES

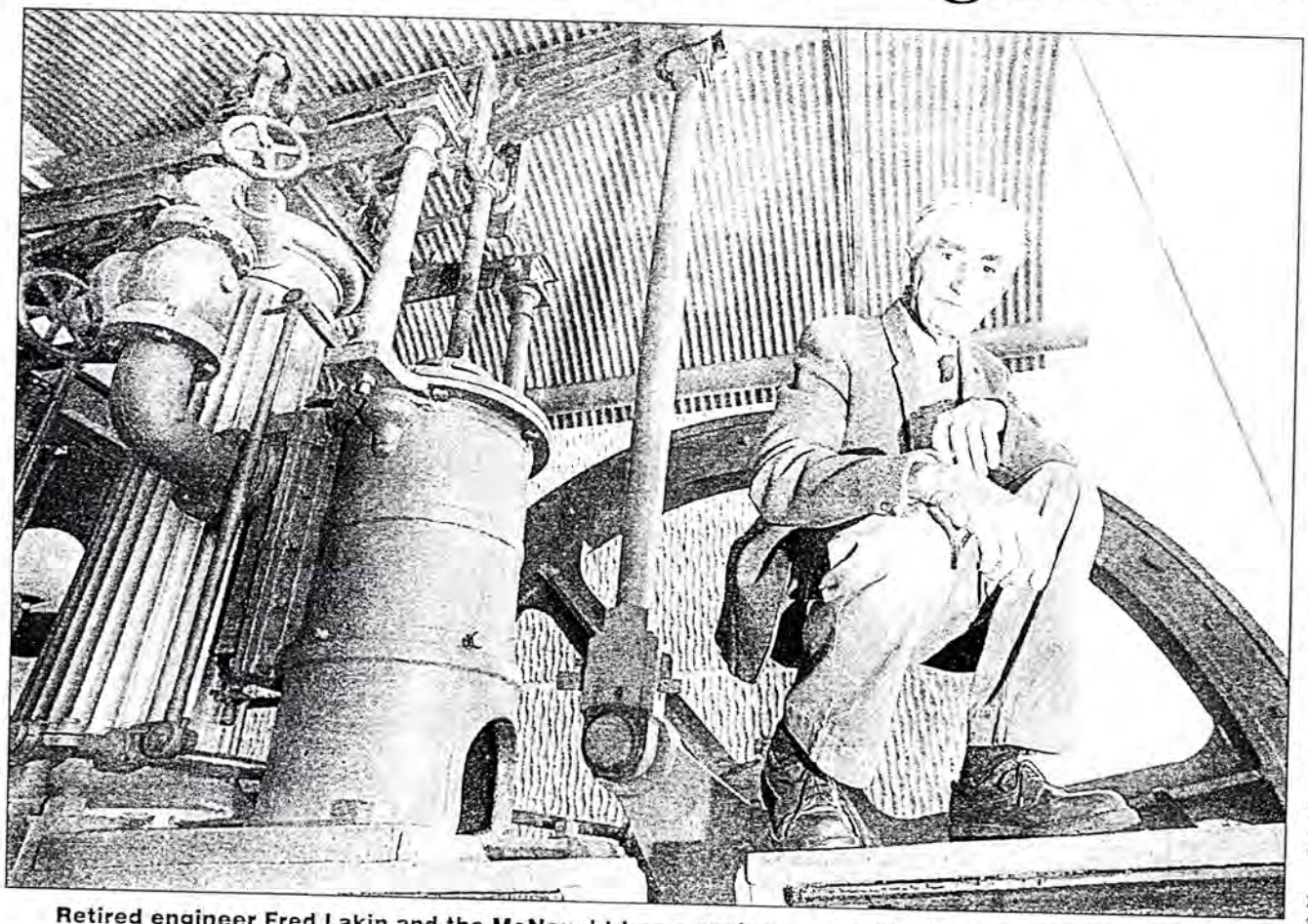
By the mid 19th century boiler pressures had increased considerably and in order to obtain additional power from this increase, many existing single cylinder engines were fitted with an additional cylinder mounted alongside the low pressure cylinder.

This frequently resulted in overstressing of the beam and William McNaught had the idea of mounting the additional cylinder on the opposite, or crank side of the column thus avoiding this overstressing. In 1845 McNaught took out a 15 year patent on the placing of the high pressure cylinder in this position and such engines became known as McNaught Beam Engines.

In other respects the engine is somewhat similar to other early engines and incorporates the parallel link motion which was patented by James Watt in 1784.

I would like to take this opportunity to thank the many people who were involved in maintaining the engine during its 35 years in the Moonah Depot of the PWD/DMR, I would further like to thank those who assisted in the removal, re-assembly and maintenance of the engine at the present site and lastly the Deputy Premier, Minister for Education and Vocational Training for participating in today's ceremony.

Hobart beam engine recognised as the world's oldest



Retired engineer Fred Lakin and the McNaught beam engine outside the Hobart Institute of TAFE.

AN important marker was achieved in Fred Lakin's life yesterday — the unveiling of an Historic Engineering Marker saluting the world's oldest McNaught beam engine.

The engine sits outside the Hobart Institute of TAFE, and yesterday it came under the umbrella of the Tasmanian Museum and Art Gallery, which will safeguard its future as a significant part of the state's heritage.

The engine was manufactured in 1854 by A. & W. Smith & Co of Paisley, Scotland.

"I'm very, very happy," Mr Lakin said yesterday.

"An ultimate goal has been achieved — as far as any one person can safeguard a piece of equipment of cultural significance."

A retired engineer and past president of the Hobart TAFE Institute Council, Mr Lakin has had an active interest in the preservation of the engine for more than 40 years. The saga began in 1955 when Risby Brothers gave it to the State Government.

Mr Lakin was one of a number of people who removed the old engine from Risby's Timber Mill and reassembled it in the Moonah depot of the then Public Works Department, where it stayed until it was moved to the Hobart Institute of TAFE in September 1990.

"We were looking for a better home," Mr Lakin said.

Two years later, the Institution of Engineers Australia held the sixth national engineering heritage conference in Hobart. Keynote speaker Angus Buchanan — a director of the Centre for the History of Technology at the University of Bath, UK, an authority on the history of early steam engines and a past president of the Newcomen Society of London, the arbiter of steam engine history — said it was likely the engine was the oldest surviving McNaught of its kind.

Mr Lakin was already committed to preserving the engine, but interest was also kindled in Peter Milner, a senior lecturer in mechanical engineering at Melbourne University who attended the Hobart engineering conference.

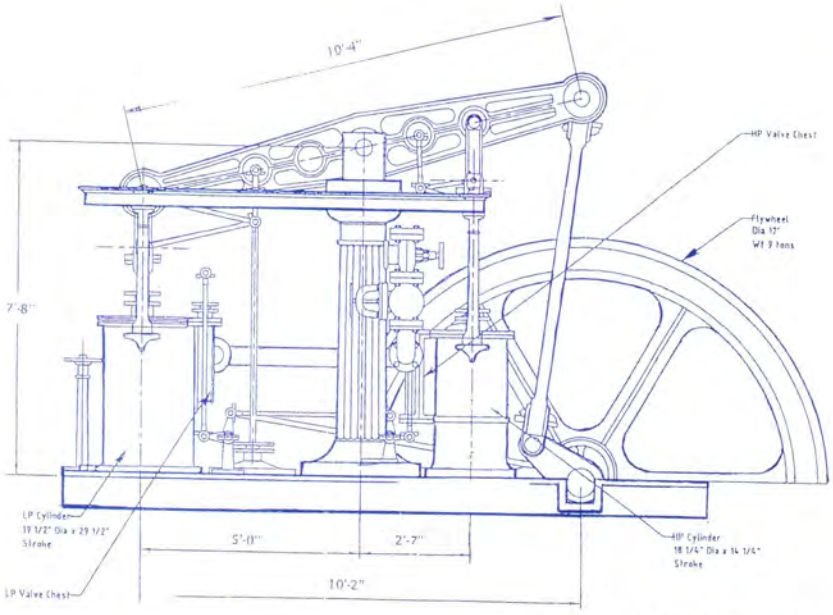
Inquiries were made overseas, and in May 1994 the Newcomen Society of London confirmed it was unable to find an older McNaught Beam Engine.

PLAQUE WORDING

WORLD'S OLDEST McNAUGHT BEAM ENGINE

THIS COMPOUND EXPANSION STEAM ENGINE INCORPORATES HIGH AND LOW PRESSURE CYLINDERS, ONE ON EITHER SIDE OF THE CENTRAL COLUMN IN ACCORDANCE WITH THE 1845 PATENT OF WILLIAM McNAUGHT, MANUFACTURED IN 1854 BY A & W SMITH OF PAISLEY, NEAR GLASGOW IN SCOTLAND, IT WAS PROBABLY IMPORTED BY PROMINENT LOCAL ENGINEER, HENRY CLARK. IN 1955, AFTER 100 YEARS OF SERVICE, THE ENGINE WAS REMOVED FROM RISBY'S SAWMILL IN COLLINS STREET, HOBART AND PLACED HERE IN 1990.

DEDICATED BY
THE INSTITUTION OF ENGINEERS, AUSTRALIA
AND THE HOBART INSTITUTE OF TAFE 1997



Mc Naught Compound Engine
Built by A & W Smith & Co
Paisley in 1854

I E Aust

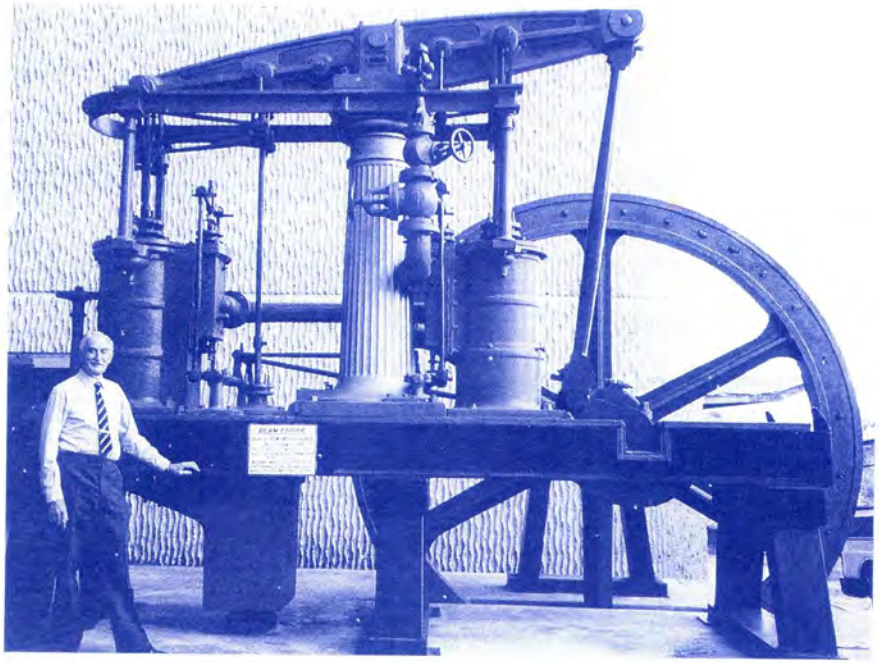
HOBART

The Institution of Engineers, Australia
The Hobart Institute of TAFE

Official Ceremony for the
Unveiling of an

Historic Engineering Marker

McNaught Beam Engine
1854



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By the mid 19th century boiler pressures had increased considerably and in order to obtain additional power from this increase, engines were fitted with an additional cylinder mounted alongside the existing low pressure cylinder.

This frequently resulted in overstressing of the beam and William McNaught had the idea of mounting the additional cylinder on the opposite, or crank side of the column, thus avoiding this overstressing. In 1845 McNaught took out a 15 year patent on the placing of the high pressure cylinder in this position and such engines became known as McNaught Beam Engines.

In other respects the engine is somewhat similar to other early engines and incorporates the parallel link motion which was patented by James Watt

From the records of boiler inspections which commenced in 1885, it is known that at this time, the engine was operating in Henry Clark Company's Sawmill in Collins Street, Hobart. This business was later bought out by Risby Bros in 1921. In July 1872 "The Engineer" (UK) reported on the manufacture by Mr John Clark of Hobart Town of a boiler for a 20 hp McNaught engine used to drive a flour mill, however, details of ownership and location are uncertain. Henry and John Clark were the sons of Alexander Clark, a prominent engineer in the Colony.

Following observations made at an Institution of Engineers Heritage Conference held in Hobart in October 1992, further enquiries were made overseas and in May 1994, the Newcomen Society of London, the World's leading authority on such matters, confirmed that this was the oldest McNaught Beam Engine in existence.

This engine is therefore of great historical interest. Unfortunately, little is known of the history of the engine prior to 1885; and its original use and date of arrival in Australia are a mystery. It is known, however, that Alexander Clark, arrived in Van Dieman's Land (Tasmania) in late 1832 and set up his own engineering business in 1838 which included both an iron foundry and workshops together with the importation of machinery. It is therefore considered most likely that he imported this engine.

Programme for the Ceremony to be held at the Hobart Institute of TAFE on Tuesday, 8th April at 3pm. 1997

Master of Ceremonies
Mr Keith Drewitt, MIE Aust.
Chairman of the Engineering Heritage committee,
Tasmania Division,
Institution of Engineers, Australia

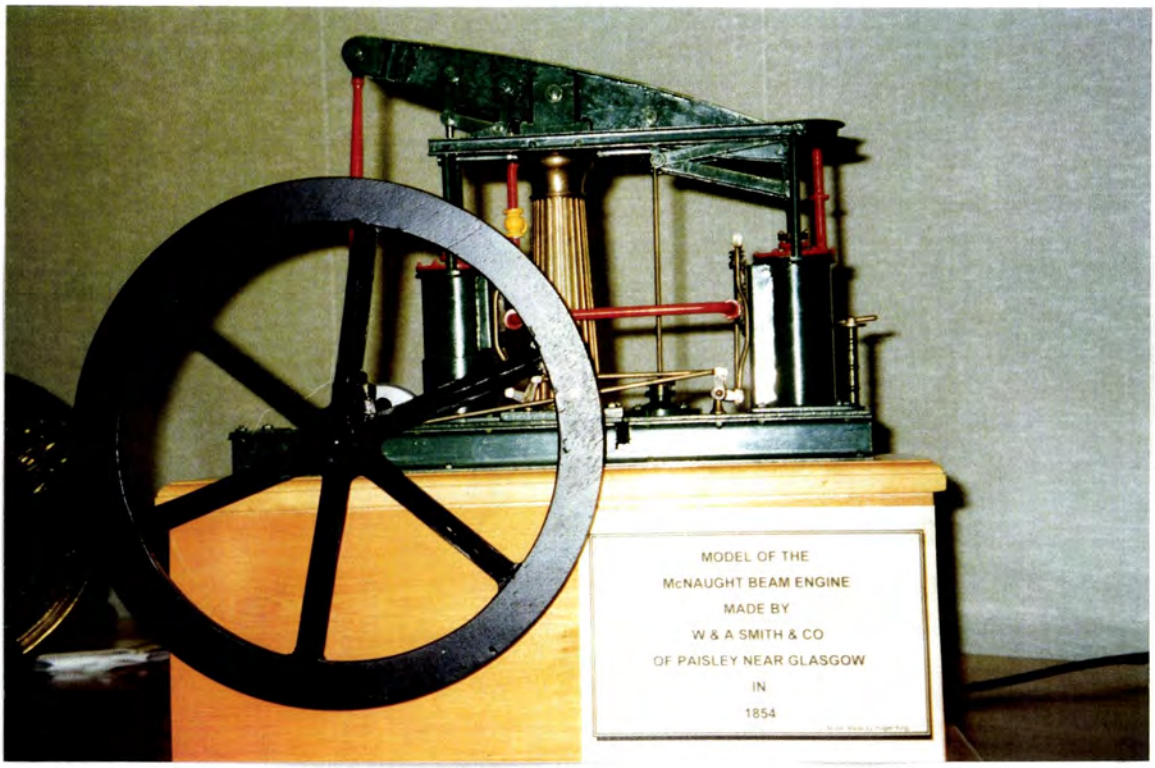
Welcoming Address
Mr Tim Burbury, FIE Aust.
President of the Tasmania Division
Institution of Engineers, Australia

Historical Address
Mr Fred Lakin, OAM MIE Aust
Vice President of the Hobart Institute of TAFE Council

Unveiling of the Historic Engineering Marker
The Hon Sue Napier MHA
Deputy Premier and Minister
for Education and Vocational Training

Response
Mr John Upson
Director of the Hobart Institute of TAFE
Mr Arthur Risby
Former Managing Director, Risby Forest Industries

Conclusion
Mr Keith Drewitt, MIE Aust.

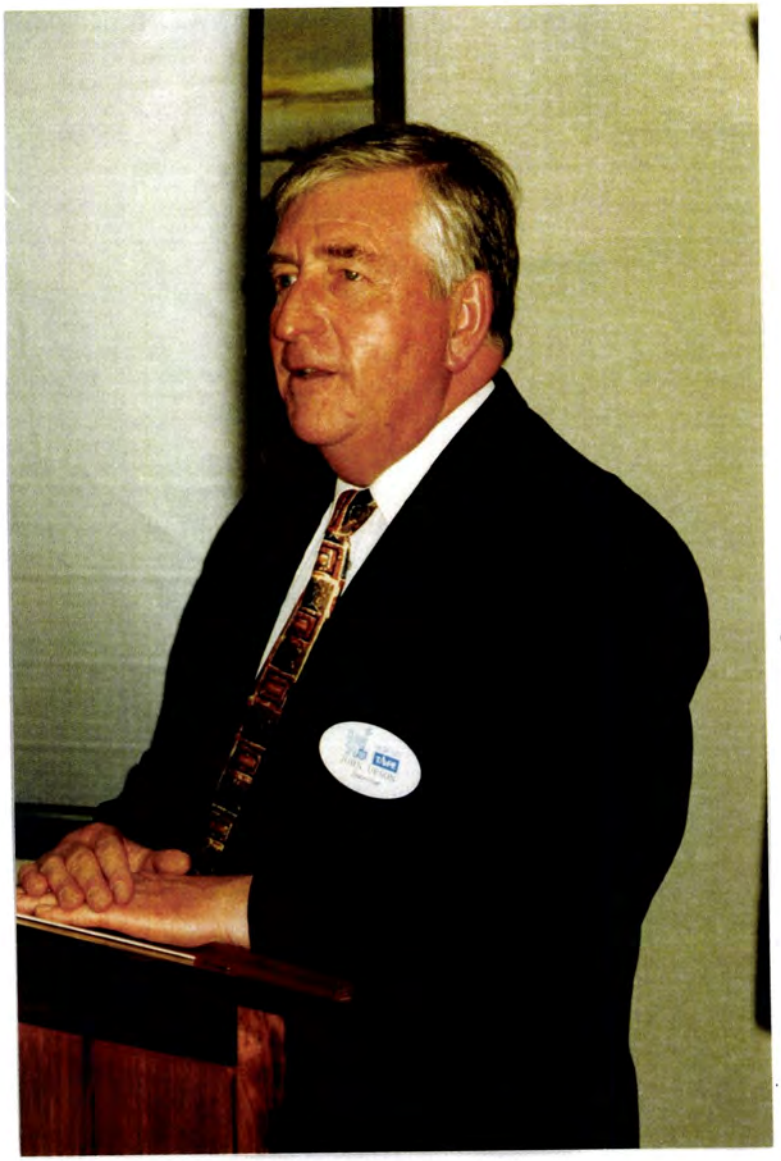


(1) Model of the Beam Engine made by Roger King and presented to Fred Lakin on his retirement from the D.M.R.

(2) Mr. Tim Burbury, President of the Tasmania Division delivering his address. Keith Drewitt at left.

(3) Fred Lakin describing the history of the Beam Engine.

(4) Fred Lakin describing the history of the Beam Engine.



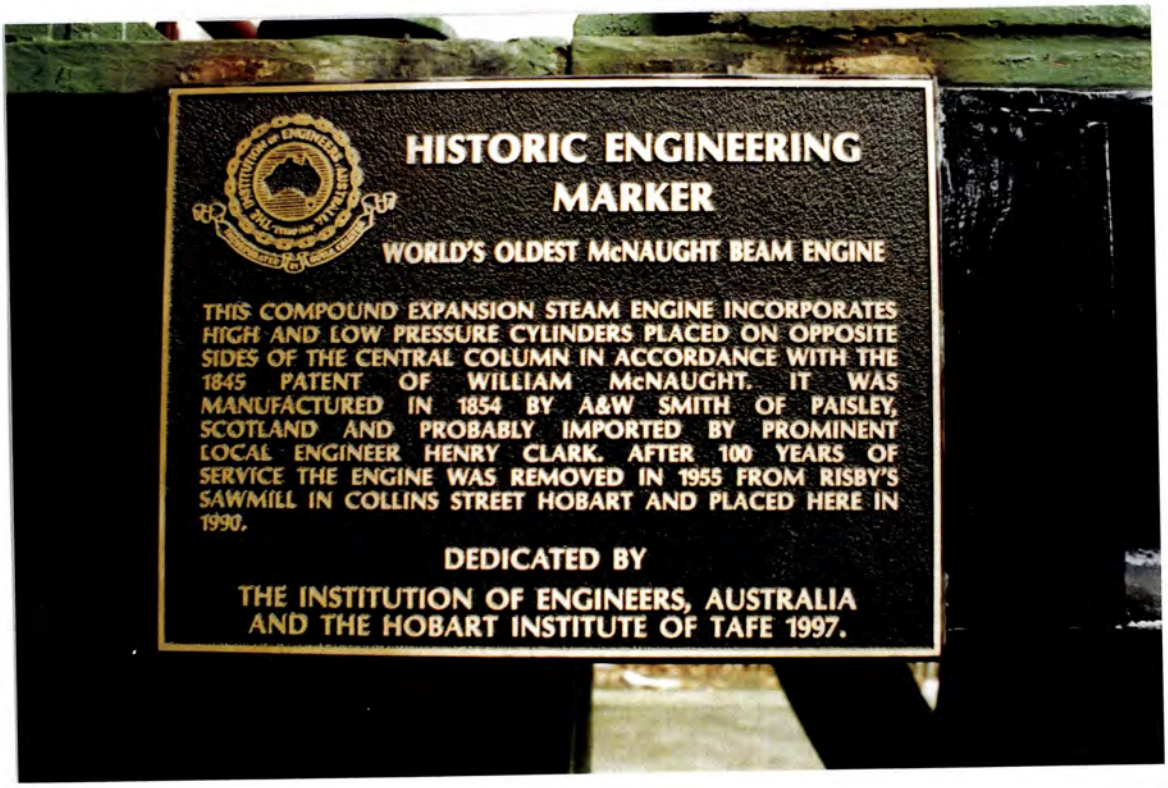
(5) **Mr. John Upson, Director of the Hobart Institute of TAFE introducing the Minister.**

(6) **The Deputy Premier & Minister for Education & Vocational Training, Mrs. Sue Napier presenting Mr. Arthur Risby with a framed photo of the Beam Engine.**

(7) **The Minister Mrs. Sue Napier unveiling the plaque. Fred Lakin on the right.**

(8) **Mrs. Napier, Fred Lakin & Arthur Risby with the model.**

(9) Part of the assembly awaiting afternoon tea.



(10) The Historic Engineering Marker.